

**Far Detector Direct APD - TEC Cooling with Refrigerant Cost Estimate:**

Number of Blocks	40	
Number of Refrigerators per Block	2	
Number of APD's Per Block	372	
Number of Refrigerators:	80	
Number of Evaporators per block	36	
Number of Circuits per refrigerator	3	
Number of TXV's per circuit	1	
Number of TXVs	240	
Number of Filter-Dryer units	240	
Number of refrigerant distributors	240	
Number of strainers	240	
Number of Pressure Instruments per refig	1	
Pounds of refrigerant per refrigerator	2.3	
Unit cost of Refrigerator	\$ 1,000	quote from ILLCO refrigeration equipment supply - phone 630-892-7904 or www.illco.com
Unit cost of Evaporator (insulated)	\$ 150	estimated assuming one length of 3/8" o.d. soft copper tubing with 12 brazed on copper flag
Unit cost of Refrigerant Piping (insulated) per circuit:	\$ 300	estimated assuming one length of 1/2" o.d. soft copper tubing with 7 tees, attached 1/4" liqui
Unit cost of Pressure Instrumentation:	\$ 133	McMaster - Carr gauge set price
Unit cost of disconnect/contacter/enclosure	\$ 500	estimated based on NuMI water skid combination disconnects and NEMA 1 starters with cor
Unit cost of refrigerant per pound	\$ 5	based on \$94 per 30 pounds at Sam's Club inflated to include cost of purchasing
Unit cost of TXV (Sporlan FJE-1/6-C 3/8 X 1/2 SAE)	\$ 45	quote from ILLCO refrigeration equipment supply - phone 630-892-7904 or www.illco.com
Unit cost of Refrigerant Distributer	\$ 18	quote from ILLCO refrigeration equipment supply - phone 630-892-7904 or www.illco.com
Unit cost of refrigerant filter-dryer	\$ 7	quote from ILLCO refrigeration equipment supply - phone 630-892-7904 or www.illco.com
Unit cost of sight glass - moisture indicator	\$ 10	quote from ILLCO refrigeration equipment supply - phone 630-892-7904 or www.illco.com
Unit cost of TXV inlet strainer	\$ 2	quote from ILLCO refrigeration equipment supply - phone 630-892-7904 or www.illco.com
Cost of Refrigerator(s) for One Block	\$ 2,000	
Cost of Evaporator(s) for One Block	\$ 5,400	
Cost of Refer Piping for One Block	\$ 1,800	
Cost of Pressure Instruments for One Block	\$ 133	
Cost of disconnect/contacter/encl for One Block	\$ 1,000	
Cost of refrigerant for One Block	\$ 10	
Cost of TXV for One Block	\$ 270	
Cost of Refrigerant Distributer for One Block	\$ 105	
Cost of Refrigerent Filter-Dryer for One Block	\$ 40	
Cost of Refrigernet Sight Glass for One Block	\$ 62	
Cost of TXV inlet strainer for One Block	\$ 9	
Sum of Block Refrigerator Part Costs	\$ 10,829	
Cost of Refrigerators for a 40 block Far Detector	\$ 433,140	